CLAIMS

Please **CANCEL** claims 1-15, 21-29, and 42-49 without prejudice or disclaimer.

A copy of all pending claims (including status identifiers) is provided below.

1. – 15. (Canceled)

16. (Previously Presented) A method of calculating estimated image profiles implemented on a tangibly-embodied storage medium resident on one or more computing devices, comprising the steps of:

providing imaging configuration characteristic data;

performing simulation calculations for various levels for each aberration component using the imaging configuration characteristic data using a processor of the one or more computing devices;

building response surface functional relations using the processor of the one or more computing devices between variables of lens characteristics and an image profile of interest using the simulation calculations; and

evaluating specified aberration values of a lens in relation to the response surface functional relations using the processor of the one or more computing devices to provide an estimate of the image profile in a presence of specified aberration(s),

wherein the building steps includes:

providing an order fitting function expressed as:

$$I_{spx}(x) = b_0 + b_1 x + b_2 x^2 + b_3 x^3 + \ldots. + b_n x^n$$

where I_{spx} is aerial image intensity or amplitude at a simulation pixel *(spx)* and x indicates defocus; and

expressing a change of the coefficients $b_0 \ldots b_n$ described by an order fitting function expressed as:

$$b_{i(with\_aberration)} = b_{i(w/o\_aberration)} + \sum_{j=2}^{Zn} \Delta b_i(cj)$$

$$= b_{i(w/o\_aberration)} + \sum_{j=2}^{Zn} \varphi_{0(i,j)} + \varphi_{1(i,j)}c_j + \varphi_{2(i,j)}c_j^{\,2} + \varphi_{3(i,j)}c_j^{\,3} + ... + \varphi_{n(i,j)}c_j^{\,n}$$

wherein

$i = 0, 1, 2, 3, ..., n;$

$b_{i(with\ aberration)}$ and $b_{i(w/o\ aberration)}$ represents one of the coefficients $b_0 \ldots b_n$ influenced by lens aberrations and the coefficients $b_0 \ldots b_n$ without aberrations, respectively, and

Δbi indicates the change in coefficients and is expressed by an n^{th} order fitting function of jth Zernike coefficient c_j,

$\varphi_{0(i,j)} \ldots \varphi_{n(i,j)}$ are the coefficients of the fitting function, determined following the performing step of setup simulations of image profile as a function of regularly iterated values of lens aberration.

17. (Previously Presented) The method of claim 16, wherein the fit coefficients $\varphi_{0(i,j)} \ldots \varphi_{n(i,j)}$ are generated from a single aberration polynomial coefficient or from at least one of multiplication division of one aberration polynomial coefficient by another.

18. (Original) The method of claim 16, wherein the coefficients $b_0 \ldots b_n$ are stored for each simulation calculation following their determination via fitting to the simulation calculation of the performing step.

19. (Original) The method of claim 16, wherein n=4.

20. (Original) The method of claim 16, wherein Zn = 37.

21. – 29. (Canceled)

30. (Previously Presented) A method of calculating estimated image profiles implemented on a tangibly-embodied storage medium resident on one or more computing devices, comprising the steps of:

performing simulation calculations using a processor of the one or more computing devices for various levels for each aberration component using image configuration characteristic data;

building response surface functional relations using the processor of the one or more computing devices between variables of the image configuration characteristics and the image profile of interest using the simulation calculations as data input to be fit using:

$$I_{spx}(x) = b_0 + b_1 x + b_2 x^2 + b_3 x^3 + \dots + b_n x^n$$

where I_{spx} indicates aerial image intensity or amplitude at a simulation pixel *(spx)* and x indicates defocus; and

expressing a change of the coefficients $b_0 \dots b_n$ using the processor of the one or more computing devices described by an order fitting function as:

$$b_{i(with\_aberration)} = b_{i(w/o\_aberration)} + \sum_{j=2}^{Zn} \Delta b_i(cj)$$

$$= b_{i(w/o\_aberration)} + \sum_{j=2}^{Zn} \varphi_{0(i,j)} + \varphi_{1(i,j)} c_j + \varphi_{2(i,j)} c_j^{\ 2} + \varphi_{3(i,j)} c_j^{\ 3} + \dots + \varphi_{n(i,j)} c_j^{\ n}$$

wherein

$b_{i(with\ aberration)}$ and $b_{i(w/o\ aberration)}$ represents the coefficients $b_0 \dots b_n$ influenced by lens aberrations and the coefficients $b_0 \dots b_n$ without aberrations, respectively,

Δbi indicates the change in coefficients and it is expressed by an n^{th} order fitting function of jth Zernike coefficient c_j; and

$\varphi_{0(i,j)} \dots \varphi_{n(i,j)}$ are the coefficients of the fitting function; and

summing an impact from at least one of all new specified aberration coefficients and combinations of aberration coefficients from the built response surface functional relations using the processor of the one or more computing devices to provide lens adjustment data.

31. (Original) The method of claim 30, wherein the imaging configuration includes lens data, illumination data and pattern data.

32. (Original) The method of claim 30, wherein:

the illumination data includes at least one of illumination distribution and illumination wavelength;

the lens data includes at least one of lens aberration, numerical aperture, pupil filters and lens configuration; and

the pattern data includes object (reticle pattern) layout.

33. (Original) The method of claim 30, wherein the simulation calculations are provided for various levels of each aberration coefficient.

34. (Previously Presented) The method of claim 30, further comprising the step of generating a new set of aberration component values using the response surface functional relations each time a new lens adjustment is considered using the processor of the one or more computing devices.

35. (Original) The method of claim 30, wherein the summing step includes interpolating data points of data calculated by the simulation calculations to provide a new image profile associated with the new specified aberration coefficients.

36. (Original) The method of claim 30, wherein the coefficients $b_0 \ldots b_n$ are stored for each simulation calculation.

37. (Original) The method of claim 30, further comprising the steps of:

defining a simulation pixel as a unit of horizontal or vertical position into which aerial image is divided;

calculating aerial image intensity or amplitude for each simulation pixel; and

executing the image simulation calculations at defocus positions to provide image profile response to focus data.

38. (Original) The method of claim 30, wherein the response surface function relations are built between any of variables: (i) position, (ii) intensity or amplitude, (iii) focus, and (iv) all component aberration levels.

39. (Original) The method of claim 30, wherein the summing step provides an output of intensity or amplitude vs. at least one of position and focus for any arbitrary set of aberration values.

40. (Original) The method of claim 30, wherein n=4.

41. (Original) The method of claim 30, wherein Zn=37.

42. – 49. (Canceled)